SPRING 1999 RELEASE ITEM
Grade 7 Science

SAMPLE OPEN-RESPONSE QUESTION

How do students provide evidence of what they know and can do in science?

The following is an example of an open-response question designed to provide an opportunity for students to show what they know and can do in the area of science:

Plant/Animal Interrelations

Plants and animals rely on one another for the production of oxygen and carbon dioxide.

a. Describe this relationship.

b. Use a diagram or flow chart to illustrate your description of the relationship.

SCIENCE CONTENT

What is the relationship of the assessment to the curriculum?

The content of the open-response question "Plant/Animal Interrelations" addresses the following Science Academic Expectation: "Students identify and analyze systems and the ways in which their components work together or affect each other" (2.3: Systems and Interactions).

This question provides a way for students to show their understanding of several concepts from the *Core Content for Science Assessment*. Students are given an opportunity to show their understanding of the interrelationship between plants and animals, the interaction between populations of living organisms and materials in the environment (i.e., gases in the atmosphere), and the atmospheric gas cycling of carbon dioxide and oxygen.

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PERFORMANCE EXPECTATIONS

How good is good enough?

Appropriate work should provide evidence of the student's understanding of how carbon dioxide and oxygen are used and/or produced by plants and animals.

For example, an appropriate response to this question would show that the student can

- clearly understand the concept of photosynthesis and cellular respiration;
- clearly and accurately describe how plants and animals rely on one another for the production of oxygen and carbon dioxide; and
- accurately draw a diagram or flow chart that illustrates the relationship between plants and animals and the cycling of carbon dioxide and oxygen.

Successful student work should provide convincing evidence that the student can use scientific content knowledge to address the relevant issue(s), although the response may not address all details and may contain some minor flaws.

APPLICATIONS

How is this relevant?

By successfully addressing this question, students demonstrate an ability to think critically about a scientific topic, to communicate scientific information through text (i.e., a written description), and to communicate scientific information through a diagram or flow chart. Students also demonstrate an understanding of how a biotic system (i.e., living organisms such as plants and animals) may interact with an abiotic system (i.e., gases in the environment). The knowledge of interactions between systems will be useful to students as they conduct scientific investigations; explore or analyze the relationships between and among systems in the environment; and communicate through words and diagrams information gathered from scientific investigations. Students will also be able to use the knowledge of interrelationships and interdependencies between and among populations of species to help them make informed decisions about issues concerning the environment.

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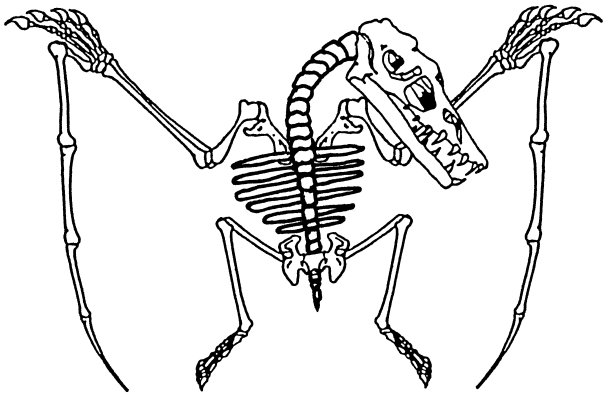
How do students provide evidence of what they know and can do in science?

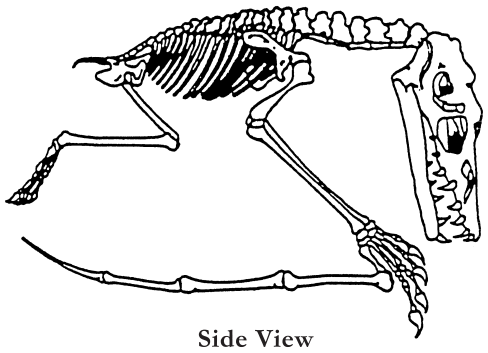
The following is an example of an open-response question designed to provide an opportunity for students to show what they know and can do in the area of science:

Dinosaur Fossil

Features such as the bone size or structure of an animal's skeleton often help scientists determine the animal's characteristics, which include how it moves, what it eats, or even the predator/prey relationships of the animal. In 1826, scientists in Germany uncovered the fossil bones of the dinosaur illustrated below.



Front View



Side View

This dinosaur was about twice the size of this drawing.

a. List three features of the skeleton of this dinosaur.

b. Explain how each of the features you listed relates to a characteristic that helped the dinosaur live.

SCIENCE CONTENT

What is the relationship of the assessment to the curriculum?

The content of the open-response question "Dinosaur Fossil" addresses the following Science Academic Expectation: "Students use the concept of scale and scientific models to explain the organization and functioning of living and non-living things and characteristics that might be observed" (2.4: Models and Scale).

This question provides a way for students to show their understanding of several concepts from the *Core Content for Science Assessment*. Students are asked to show their understanding of an organism's structures, of how the structures function, and of how models can be used to convey information about an organism that once lived.

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PERFORMANCE EXPECTATIONS

How good is good enough?

An appropriate student response should provide evidence of the student's understanding of how the fossilized structures of an organism can convey information about how the organism functioned when it was alive.

For example, an appropriate response to this question would show that the student can

- clearly identify important and distinctive features of a dinosaur skeleton shown in a graphic model; and
- clearly and accurately explain how each of the identified features relates to a characteristic that helped the dinosaur live when it was alive.

Successful student work should provide convincing evidence that the student can use scientific content knowledge to address the relevant issue(s), although the response may not address all details and may contain some minor flaws.

APPLICATIONS

How is this relevant?

This question addresses some of the fundamental aspects of scientific inquiry. By successfully answering this question, students demonstrate the ability to observe a model and to interpret and analyze information provided by the model. Students also demonstrate an understanding of structure and function. This ability and knowledge will help students investigate situations and interpret evidence encountered in everyday life, as well as to make inferences about characteristics of systems that may never actually be observed directly.

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SAMPLE OPEN-RESPONSE QUESTION

How do students provide evidence of what they know and can do in science?

The following is an example of an open-response question designed to provide an opportunity for students to show what they know and can do in the area of science:

Soil Formation

Soil is created through the actions of natural earth forces. Soil is made of many different types of materials such as sand, clay, silt, and decayed matter.

a. Identify three forces that cause soil to be formed.

b. Explain how each of these forces produces soil.

SCIENCE CONTENT

What is the relationship of the assessment to the curriculum?

The content of the open-response question "Soil Formation" addresses the following Science Academic Expectation: "Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events" (2.2: Patterns).

This question provides a way for students to show their understanding of several concepts from the *Core Content for Science Assessment*. Students are asked to show their understanding of soil and some of the basic geological processes that lead to soil formation.

PERFORMANCE EXPECTATIONS

How good is good enough?

An appropriate student response should provide evidence of the student's understanding of soil and some of the basic geological processes that lead to the formation of soil.

For example, an appropriate response to this question would show that the student can

- clearly understand the concept of natural earth forces;
- correctly identify three forces that cause soil to be formed (e.g., wind, water, animal decay); and
- clearly and accurately explain how each of these forces acts to produce soil (e.g., explain how the wind and water work to breaks down large solid materials into smaller pieces to form soil).

Successful student work should provide convincing evidence that the student can use scientific content knowledge to address the relevant issue(s), although the response may not address all details and may contain some minor flaws.

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APPLICATIONS

How is this relevant?

By successfully answering this question, students demonstrate the ability to recognize and analyze alternative explanations for a similar result and to communicate scientific explanations. Students also demonstrate an understanding of the different forces in nature that produce soil. This ability and knowledge will be useful to students as they explore the causes of natural phenomena and solve problems in everyday life, for they may recognize that there are often several possible explanations for a natural event or several possible solutions to a problem.

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How do students provide evidence of what they know and can do in science?

The following is an example of an open-response question designed to provide an opportunity for students to show what they know and can do in the area of science:

Acid Rain

Acid rain is a major problem in many parts of the United States. It can harm both plant and animal life and can cause changes to physical structures (natural or manmade). Rainwater is normally slightly acidic, but sometimes enough pollutants mix with the water in the sky to make the rainwater more acidic than normal.

a. Describe **two** tests you could perform to determine if the rainwater in your town is acidic.

b. Choose a plant, an animal, or a physical structure and explain what damage acid rain could do to it.

SCIENCE CONTENT

What is the relationship of the assessment to the curriculum?

The content of the open-response question "Acid Rain" addresses the following Science Academic Expectation: "Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events" (2.2: Patterns).

This question provides a way for students to show their understanding of several concepts from the *Core Content for Science Assessment*. In addition to the basic concept of scientific inquiry, students are asked to show their understanding of water as a solvent, of how substances react chemically with other substances, of how substances are often placed in categories or groups if they react in similar ways, and of the effect of a chemical substance on living organisms or non-living structures.

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PERFORMANCE EXPECTATIONS

How good is good enough?

An appropriate student response should provide evidence of the student's understanding of alternative ways to test for acidity (pH) of rain water and of the possible reactions of biological or physical materials with acids.

For example, an appropriate response to this question would show that the student can

- clearly and accurately describe two tests that could be performed to determine if rainwater is acidic; and
- clearly and accurately explain how acid rain can cause damage to a biological structure (e.g., plant or animal) or a physical structure (e.g., a building).

Successful student work should provide convincing evidence that the student can use scientific content and inquiry skills to address the relevant issue(s), although the response may not address all details and may contain some minor flaws.

APPLICATIONS

How is this relevant?

This question addresses some of the fundamental aspects of scientific inquiry. By successfully answering this question, students demonstrate the ability to describe tools or techniques that could be used to gather data and to use scientific information to predict the effect that one material would have on another material. Students also demonstrate an understanding of scientific concepts relating to acidity and of physical factors in the environment that may affect everyday life. This ability and knowledge may help students to propose or design appropriate testing procedures for scientific investigations, and to better understand how certain environmental changes affect physical and biological structures in the environment.